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The MeV Point-Source Sky during the COMPTEL Mission

W. Collmar[1], S. Zhang[2], H. Steinle[1], A. Strong[1], V. Schönfelder[1]

[1]MPE, Garching, Germany [2]IHEP, Beijing, China

Abstract

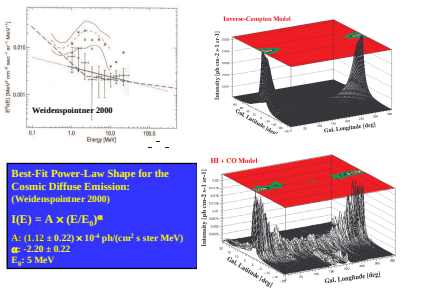
The COMPTEL experiment aboard CGRO pioneerd the MeV sky (0.75 – 30 MeV) between 1991 and 2000. The 1. COMPTEL source catalog (Schönfelder et al. 2000), covering roughly the first 4-5 years of the mission, lists 32 steady MeV sources. To improve on that, we reanalyse consistently all COMPTEL data from the beginning to the end of the mission by carrying out all-sky point source analyses in different energy bands for different time periods (sum of all data as well as subdivisions). The goal of the analyses is to derive 1) a consistent survey on MeV sources for the complete mission, and 2) the variability behaviour (light curves, spectra) for the brighter and more significant MeV sources. These results shall finally be summarized in a 2. COMPTEL source catalog. Up to now, we found clear evidence for several new source detections (i.e. not listed in the 1. COMPTEL source catalog), unidentifieds as well as known ones (e.g. spatially coincident with EGRET sources).

In this poster we show, for the first time, *all-mission all-sky* maps - i.e. they contain all mission data from the first to the last COMPTEL observing period – in the 3 (1-3, 3-10, 10-30 MeV) standard COMPTEL bands. The time-average strongest MeV sources are visible. Apart from known Gamma-ray sources, there is evidence for unknown source features. Whether these are real source features or analysis artefacts is currently investigated. The visible sources should be prime candidates (especially in the 1-3 MeV band) for INTEGRAL detections around or aboce 1 MeV.

Method

To carry out these systematic source searches, we generated all-sky maps in galactic coordinates for different energy bands and time periods. To account for the distortions of maps near the galactic poles, we supplemented these maps by galactic poles maps, where the analysis is done in a local coordinate system centered on the galactic north and south poles (see below).

The analysis procedure applied the standard COMPTEL maximum-likelihood method, which generates skymaps and determines source parameters, like detection significances, fluxes, and flux errors. An estimate for the instrumental background of COMPTEL is derived by using the standard filter technique in the COMPTEL data space (Bloemen et al. 1994). For the analysis, especially along the galactic plane, the handling of the diffuse emission is essential. To account for that, we included 3 global models (see Figure), which represent the galactic diffuse emission (HI+CO, and inverse Compton) and the isotrope extragalactic emission in the fitting procedure. For each energy band, the scaling factor for the extragalactic model was fixed to values integrated from its spectral shape at MeV energies (derived by Weidenspointner 2000), while the scaling factors for the galactic diffuse models (HI+CO, IC) were simultaneously fitted with the fluxes of the most prominent sources. By this method we derive for each energy band best-fit flux values of the 2 galactic diffuse components and of several (up to 7) sources simultaneously.



Handling of the diffuse models. The globally applied models as well as the assumed spectral shape of the cosmic diffuse emission are shown. The scaling factors are derived by integrating this shape for the selected energy band.

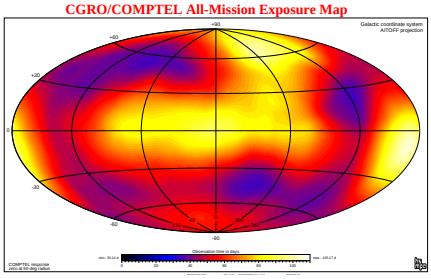
References

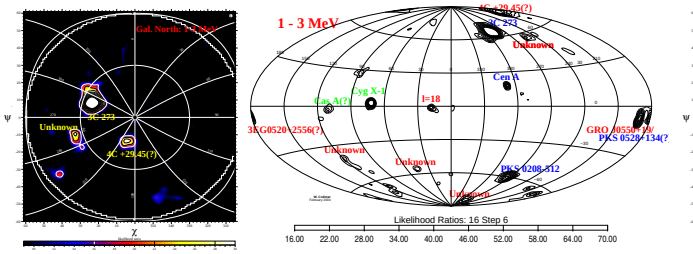
Schönfelder, V. et al. 2000, A&A Suppl. 143, 145

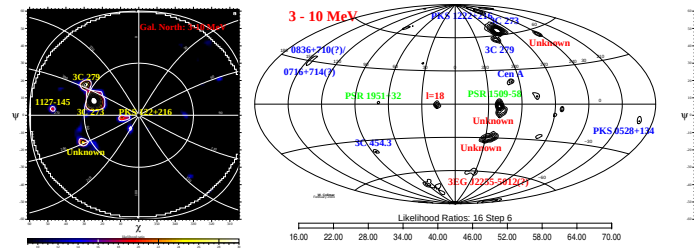
Bloemen, H. et al. 1994, ApJS 92, 419

Weidenspointner, G. 2000, MPE PHD Thesis

CGRO/COMPTEL All-Mission Exposure Map







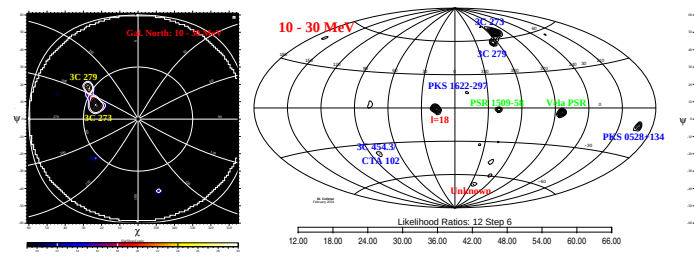
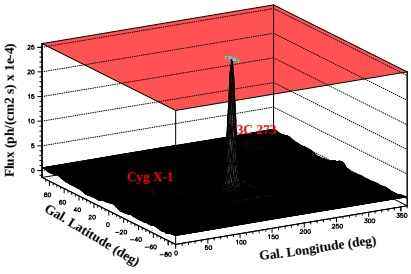


Figure Captions

Left: The COMPTEL *all-mission all-sky point- source* significance maps in 3 different energy bands (middle). They are supplemented by maps in local coordinates centered on the galactic north (left) and south (right) poles. The contour levels start at likelihood ratios of 16 (4σ for a known source) for the 1-3 and 3-10 MeV bands and at 12 (3.5σ for a known source) at the (“cleaner”) 10-30 MeV band.The diffuse emissions as well as the by far strongest MeV source, the Crab pulsar + nebula, are removed from the maps. The “Unknown” source feature are currently checked.

Above: COMPTEL *all-mission all-sky* exposure map in effective days, i.e. number of days with direct pointings.

Below: An 1-3 MeV all-sky flux map for the sum of the first 6 years of the COMPTEL mission including the Crab. The time-averaged fluxes of the next brightest sources in this band, 3C 273 and Cyg X-1, are about 10% of the Crab flux.



For further information, please contact: wec@mpe.mpg.de